

given the necessary instructions to the Professor of Physical and Natural Sciences, Frère Constantin, who will have charge of the work.

Mr. Pollock reports that the wind vane and anemometer support has been placed on the brick roof of the observatory of the college and that the exposure is an excellent one. The foundation for the support is of solid mahogany blocks buried in cement to a depth of about ten inches and is so firm that it is expected to withstand the strongest wind. In the observatory are many modern well-kept instruments.

A SEVERE HAILSTORM AT GRAND RAPIDS, MICH.

Mr. C. F. Schneider, Section Director, Grand Rapids, Michigan, reports as follows in regard to the hailstorm of Thursday, May 4, 1905:

Severe thunderstorm. First thunder heard at 1:20 p. m., central standard time; last at 6:45 p. m. Storm came from the southwest. Excessive rain from 1:40 to 2:20 p. m., accompanied from 1:46 to 1:56 p. m. by the most violent and copious fall of hail ever known to have occurred in this vicinity. The hail fell without cessation for fully ten minutes, almost completely covering the ground. The stones were particularly large, most of them being from one to two inches in diameter and some slightly larger than two inches. The storm passed over the central portion of the city, there being but little rain and no hail in the extreme western and eastern sections. Considerable damage was done by the hail, the greenhouses being especial sufferers. Nearly all skylights and many windows in residences and churches within the storm's path were broken. Precipitation to the amount of 0.79 inch fell between 1:40 and 2 p. m., most of it falling between 1:50 and 2 p. m.

The above has been held for some time hoping to obtain data that will enable us to define the length and width of the area covered by hail, but as the only other detailed reports at hand also come from Grand Rapids, we may infer that the hailstorm did not cover any very large area in the central portion of lower Michigan. The following are additional stations in lower Michigan reporting hail on the fourth of May: Grand Haven, light hail between 5:10 and 6:05 p. m.; Hagar, hail and thunder, between 5:30 and 6:15 p. m.; Reed City, hail and thunder, between 1:30 and 2:45 p. m.; Stanton, hailstorm, between 12:30 and 3:00 p. m., did very little damage; Webberville, hard electric storm with hail, between 4:20 and 6:50 p. m.

Heavy thunderstorms were reported from nearly all sections of lower Michigan on the above date, but the falls of hail were apparently confined to small and widely scattered areas.

METEOROLOGICAL COURSE AT WILLIAMS COLLEGE.

In the MONTHLY WEATHER REVIEW for November, 1904, page 517, the course in meteorology at present maintained at Williams College was briefly described. As there stated a lithographed syllabus, covering both text-book and lectures, is closely followed. Chapters VI to VIII, inclusive, of this syllabus were published in the MONTHLY WEATHER REVIEW for April, 1905, page 159, after being somewhat revised by the author, and Chapters I to V are now published so that teachers and lecturers may have the advantage of examining the whole work. The numbers on the right-hand side refer to the sections of Davis's Elementary Meteorology, which is the chief book of reference used by Professor Milham, and which is followed quite generally as a text-book.

A COURSE OF INSTRUCTION IN METEOROLOGY AT WILLIAMS COLLEGE.

Chapter I. Introduction—the atmosphere.

II. Heat of the atmosphere.

III. The observation and distribution of atmospheric temperature.

IV. The pressure and circulation of the atmosphere.

- A. The observation and distribution of pressure.
- B. The observation and distribution of the winds.
- C. The convectional theory and its comparison with the observed facts.
- D. A general classification of the winds.

Chapter V. The moisture of the atmosphere.

- A. The water vapor of the atmosphere.
- B. Dew, frost, fog.
- C. Clouds.
- D. Precipitation.

VI. The secondary circulation of the atmosphere.

- A. Tropical cyclones.
- B. Extratropical cyclones.
- C. Thundershowers.
- D. Tornadoes.
- E. Waterspouts, whirlwinds.
- F. Cyclonic and local winds.

VII. Weather bureaus and their work.

VIII. Weather prediction.

IX. Climate.

X. Floods and river stages.

XI. Atmospheric electricity.

XII. Atmospheric optics.

XIII. Atmospheric acoustics.

CHAPTER I.

INTRODUCTION—THE ATMOSPHERE.

Section 1.—Introduction.

- (1) The science of meteorology, 1.
- (2) Outline history of meteorology.
- (3) Utility.
- (4) Relation to physics and astronomy, 3.

Section 2.—The atmosphere.

- (1) The atmosphere.
- (2) Composition of the atmosphere, 7.
- (3) Offices and activities of the atmosphere, 8, 9, 10, 11, 12.
- (4) Atmosphere of other planets, 4.
- (5) Evolution of the atmosphere, 5.
- (6) Future of the atmosphere, 6.

Section 3.—Pressure and height of the atmosphere.

- (1) Geosphere, hydrosphere, atmosphere, 13.
- (2) Gravity and its effects.
- (3) Dimensions of the geosphere and hydrosphere, 14.
- (4) Pressure of the atmosphere, 15, 16, 17.
- (5) Isobaric surfaces in the atmosphere, 18, 19.
- (6) Height of the atmosphere, 20.

Section 4.—The meteorological elements.

- (1) The meteorological elements.
- (2) Weather and climate.
- (3) Normal values.

Section 5.—The plan of the book.

- (1) The plan of the book, 21.
- (2) Methods of investigation.

CHAPTER II.

HEAT OF THE ATMOSPHERE.

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Section 2.—Sources of heat, 21.

Section 3.—Insolation.

- (1) Amount, 25.
- (2) Variation with latitude, time of year and distance from the sun, 26, 27.
- (3) Distribution over the earth, 27.

Section 4.—Interrelation of matter and radiant energy.

- (1) Reflection, 29.
- (2) Transmission, 31.
- (3) Absorption, 31.
- (4) Effects of absorption, 32.
- (5) Actinometry, 33.
- (6) Behavior of the ocean as regards reflection, transmission, and absorption, 37.
- (7) Behavior of the land as regards reflection, transmission, and absorption, 22, 34, 39, 40.
- (8) Behavior of the atmosphere as regards reflection, transmission, and absorption, 35.

Section 5.—Conduction and convection.

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- (2) Conduction of heat between air and land, 42.
- (3) Convection in water, 44.
- (4) Convection in the atmosphere, 45.
- (5) Evidences of convection: mirage, whirlwinds, clouds, 46, 47, 53, 54.
- (6) Difference between convection in liquids and gases, 48.
- (7) Change in temperature in vertical currents, 59.

Section 6.—Temperature gradients.

- (1) Average vertical temperature gradient, range, 36, 38.
- (2) Inversion of temperature, 43.
- (3) Nocturnal stability, 51.
- (4) Diurnal instability, 52.
- (5) Conditions of convection, 50.